Technique for safe removal of an aortic endograft with suprarenal fixation

Olivier H. J. Koning, MD, Jan-Willem Hinnen, MD, and **Jary M. van Baalen, MD, PhD,**
Leiden, The Netherlands

Complete removal of an aortic endograft with suprarenal fixation is difficult. We report the use of a simple device to extract a Zenith endograft. This device is made by cutting off the tip of the cylinder of a 20-mL syringe and rounding off the edges. The main body of the graft is resheathed by advancing the cylinder cranially while keeping the graft in a stable position. This way, the graft collapses and the hooks are withdrawn without tearing the wall of the aorta. The supraceliac clamping time in our patient was less than 2 minutes. This technique offers a safe and fast solution to the potentially hazardous removal of an aortic endograft with suprarenal fixation. (J Vasc Surg 2006;43:855-7.)

Suprarenal fixation of an endovascular graft is designed to reduce the risk of endograft migration. However, when endograft removal is required, this design may complicate the surgical procedure.[1] To avoid this problem, the aortic endograft can be cut at the infrarenal level, and a subsequent conventional in situ reconstruction can be performed.[1] In case of an aortic endograft infection, however, removal of the entire graft is required, followed by in situ reconstruction or an alternative procedure.[2] The hooks that are incorporated in the top stent of the Zenith graft (Cook, Bjaeverskov, Denmark) can make the removal of the endograft hazardous because of the firm fixation in the tissue of the aorta. Simple extraction can lead to irreparable damage of the juxtarenal aorta. Cutting the top stent with a wire cutter can be tedious and difficult because of the proximal position of the stent. This will lengthen the time needed to clamp the aorta. We report a technique for safe and fast removal of an aortic endograft by using a simple on-site-constructed device.

TECHNIQUE

A device to remove the aortic endograft is constructed by cutting off the tip of the cylinder of a 20-mL syringe with a No. 21 surgical blade. Using the entire length of the cylinder makes manipulation of the cylinder easier. The outer diameter of the cylinder is 19 mm and will therefore fit into most aortas. The edge of the cylinder is rounded off by using a bone file or a surgical blade. The extraction device is then ready for use (Fig 1).

For proximal control of the aorta, the supraceliac/distal thoracic aorta is prepared for clamping by using the technique described by May et al.[3] For distal control, the iliac arteries are prepared for clamping distal to the level of anticipated anastomosis of the in situ graft. Alternatively, balloon occlusion can be used after removal of the iliac legs of the graft. If there is no

Fig 1. Device made of a syringe.

proximal endoleak, the aneurysm is opened. The endograft is clamped at the exposed main body. The iliac legs are removed from the iliac arteries by retrograde traction. This can normally be performed without difficulty or risk.[1] The iliac arteries are occluded after distal graft removal. Next, the supraceliac aorta is clamped, and the clamp on the main body is removed. By using retraction tape, the main body of the endograft is retracted into the extraction device by gently moving the extraction device cranially and leaving the endograft in place (Fig 2). The device is moved cranially into the neck of the aneurysm, carefully guiding the endograft with the external stents into it while avoiding any cranial or caudal movement of the endograft. The second-most cranial stent of the Zenith device is an internal stent, so there is no problem advancing the device in the area of overlap with the aneurysm neck. The top-stent with the hooks is collapsed into the device, thereby retracting the hooks from the wall of the aorta without damaging it (Fig 3). This bimanual maneuver, using one hand to stabilize the graft and the other to advance the extraction device, can be performed in a controlled way without using a lot of force. The hooks come away from the aorta without difficulty, because the diameter of the extraction device is significantly smaller than that of the endograft and the aorta (Figs 2 and 3). This way, the aortic endograft can be retracted in one piece without the need to incise the aorta to reach and

From the Department of Surgery, Division of Vascular Surgery, Leiden University Medical Center.
Competition of interest: none.
Reprint requests: Olivier H. J. Koning, MD, Department of Surgery, Leiden University Medical Center, Albinusdreef 2, 2333 ZA Leiden, The Netherlands (e-mail: koning@lumc.nl).
0741-5214/$32.00

doi:10.1016/j.jvs.2005.12.011

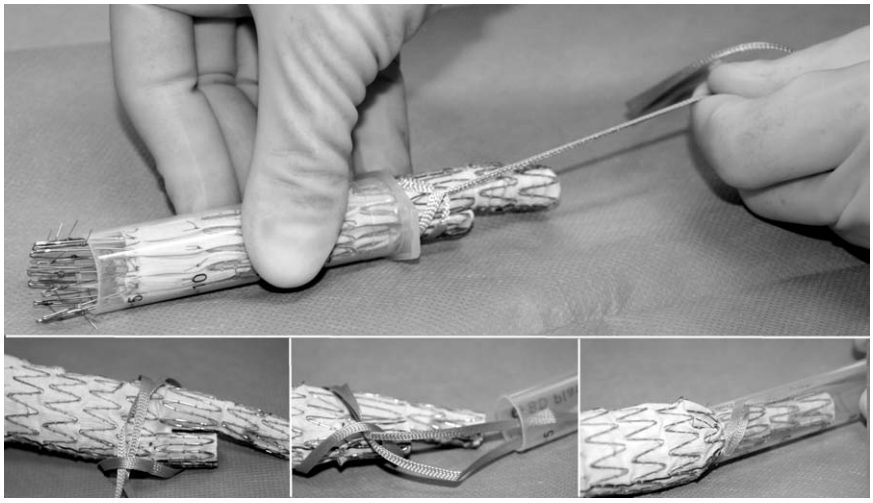

Fig 2. The retraction tape is used to pull the stent graft through the device. The device is carefully moved cranially over the stent graft, and the latter is left in place.

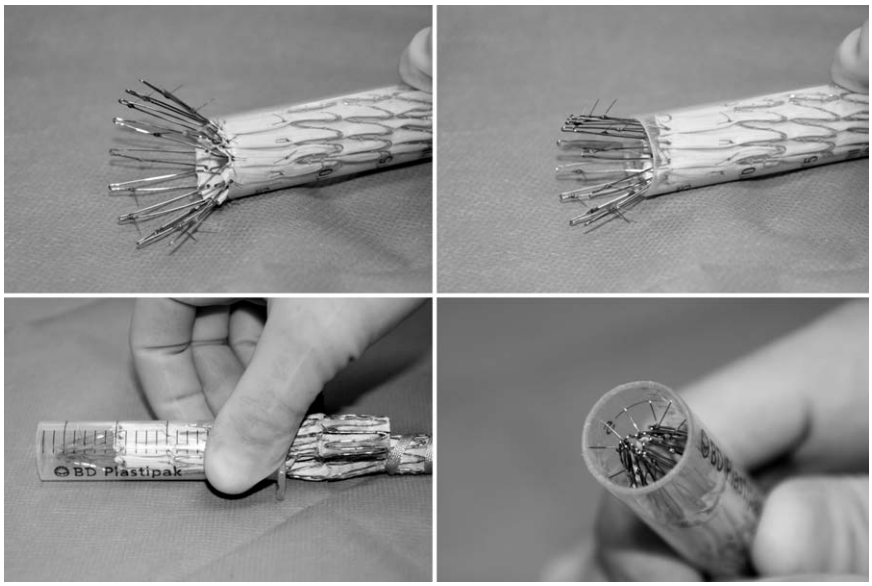

Fig 3. The top stent is collapsed into the device, retracting the hooks from the wall of the aorta without damaging it.

cut the top stent. This saves suprarenal clamping time and tissue for infrarenal clamping and anastomosis. Now, the aorta clamp can be switched to the level of the infrarenal aorta, and reconstruction is performed.

We performed this procedure in a patient with an aortic endograft infection. The time needed for supraceliac clamping was less than 2 minutes. There was no sign of damage to the arterial wall. An infrarenal in situ reconstruction was performed without difficulty.

DISCUSSION

Conversion to open repair after endovascular abdominal aortic aneurysm repair is associated with significant morbidity and mortality.[4] The technical aspects of this procedure are challenging, especially when a device with suprarenal fixation is used during endovascular repair.

We report a simple technique to facilitate complete removal of a Zenith endograft by using a device made at the operating table. This technique enabled fast and safe removal of the entire aortic endograft with a very short time of supraceliac clamping in a case with no proximal endoleak. The main advantage of the technique is that the endograft is resheathed, thereby collapsing the endograft and withdrawing the hooks from the wall of the aorta without damaging it. Special care must be taken with extraction of an endograft in the absence of infection, because incorporation of the endograft into the

aortic tissue might hinder this procedure. If for this or another reason it is impossible to remove the endograft from the aorta by using this technique, the extraction device can be removed without difficulty, and an alternative technique can be used.

In case of a proximal endoleak, the procedure can be adjusted slightly. First, the supraceliac aorta is clamped. Next the aneurysm is opened, and the two iliac legs are clamped. The main body of the aortic endograft is separated from the legs and inserted in the extraction device, followed by endograft extraction, by using the method described previously.

CONCLUSION

This technique offers a safe and fast solution to the potentially hazardous removal of an aortic endograft with suprarenal fixation.

REFERENCES

1. May J, White GH, Harris JP. Techniques for surgical conversion of aortic endoprosthesis. Eur J Vasc Endovasc Surg 1999;18:284-9.
2. Ducasse E, Calisti A, Speziale F, Rizzo L, Misuraca M, Fiorani P. Aortoiliac stent graft infection: current problems and management. Ann Vasc Surg 2004;18:521-6.
3. May J, Patrick W, Harris J. Transabdominal exposure of the thoracic aorta. Surg Gynecol Obstet 1980;151:803-5.
4. Cuypers PWM, Laheij RJF, Buth J. Which factors increase the risk of conversion to open surgery following endovascular abdominal aortic aneurysm repair? The EUROSTAR collaborators. Eur J Vasc Endovasc Surg 2000;20:183-9.

Submitted Oct 31, 2005; accepted Dec 5, 2005.